

Notice of Allowability

Application No.

10/765,246

Examiner

Zia R. Hashmi

Applicant(s)

SWENSON, DAVID R.

Art Unit

2881

PM

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/9/2005.
2. ☒ The allowed claim(s) is/are 1-34.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Allowable Subject Matter

1. An "Amendment" was received on November 9, 2005, in response to Office Action of May 4, 2005.
2. Claims 1-34 are allowed.
3. The following is an examiner's statement of reasons for allowance:
4. With respect to independent claim 1, prior art fails to disclose a method of determining an average charge state, \bar{q} of cluster ions in a cluster ion beam having a beam path within a reduced-pressure chamber, comprising the steps of: providing, within the reduced-pressure chamber, a cluster ion beam attenuator, a particle flow rate measurement means, and a cluster ion beam current measurement means, disposing the cluster ion beam attenuator within the path of the cluster ion beam to form an attenuated sample of the cluster ion beam; measuring, in turn, the particle flow rate, P , of the attenuated sample of the cluster ion beam and the cluster ion beam current, I , of the attenuated sample of the cluster ion beam; and calculating a measure of the average charge state, \bar{q} , of cluster ions in the cluster ion beam by using the equation

$$\bar{q} = \frac{\alpha I}{\beta e \Gamma}$$

wherein, α , and β , are calibration constants and e is the magnitude of the electronic charge.

5. With respect to independent claims 8, 13, and 18, prior art fails to disclose

methods of determining an average energy, \overline{E} , and average mass, \overline{m} , of cluster ions in a cluster ion beam having a beam path within a reduced-pressure chamber, comprising the steps of: providing, within the reduced-pressure chamber, an average energy per charge measurement means, a particle flow rate measurement means, and a cluster ion beam current measurement means; disposing the cluster ion beam attenuator within the path of said cluster ion beam to form an attenuated sample of the cluster ion beam; measuring, in turn but in any order, the particle flow rate, Γ , of the attenuated sample of the cluster ion beam, and the cluster ion beam current, I , of the attenuated sample of the cluster ion beam, and the average energy per charge, (E/q) , of the cluster ions in the attenuated sample of the cluster ion beam; and calculating a measure of the average energy, \overline{E} and \overline{m} of cluster ions in the cluster ion beam by using the equations

$$\overline{q} = \frac{\alpha I}{\beta e \Gamma}, \text{ and}$$

$$\overline{E} = \overline{q} \left(\frac{E}{q} \right)_{\text{average}}, \text{ and}$$

$$\overline{m} = \overline{q} \left(\frac{m}{q} \right)_{\text{average}},$$

wherein α , and β , are calibration constants and e is the magnitude of the electronic charge.

6. With respect to independent claims 23, 26, 29, and 32, prior art further fails to disclose an apparatus utilizing a gas cluster ion beam for processing a surface of a workpiece, the apparatus comprising: a vacuum vessel, a gas cluster ion beam source within the vacuum vessel for producing a gas cluster ion beam; an accelerator for

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accelerating the gas cluster ion beam along a beam path; workpiece holding means within the vacuum vessel for holding the workpiece for gas cluster ion beam processing; first controllable moving means for selectively scanning the workpiece holding means and the workpiece through the accelerated gas cluster ion beam at a location along the beam path and for selectively removing the workpiece holding means and the workpiece from the gas cluster ion beam path; a cluster ion beam attenuator within the vacuum vessel with second controllable moving means for selectively positioning the attenuator within the gas cluster ion beam path for forming an attenuated sample of the gas cluster ion beam or for positioning the attenuator away from the gas cluster ion beam path for allowing workpiece processing by the un-attenuated gas cluster ion beam; cluster ion beam current measurement means for measuring a current, I , of the attenuated sample of the gas cluster ion beam; particle flow rate measurement means for measuring a particle flow rate, Γ , of the attenuated sample of the gas cluster ion beam; time-of-flight measurement means for measuring an average velocity, \bar{v} , of cluster ions in said attenuated sample of the gas cluster ion beam; spectrometer means for measuring an average energy per charge, (E/q) , of the cluster ions in the attenuated sample of the cluster ion beam; calculating means for processing measurements of (E/q) , I , Γ , and \bar{v} , to calculate a measure of an average mass, \bar{m} , of cluster ions in the gas cluster ion beam; and control means for providing signals to the first and second controllable moving means for positioning the attenuator within the gas cluster ion beam path for making average mass, \bar{m} , measurement and also for positioning the attenuator

away from the gas cluster ion beam path and for scanning the workpiece through the gas cluster ion beam path for workpiece processing.

Claims 2-7, 9-12, 14-17, 19-22, 24-25, 27-28, 30-32, and 33-34, are allowed by virtue of their dependencies on the independent claims 1, 8, 13, 18, 23, 26, 29, and 32.

Conclusion

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments of Statement of Reasons for Allowance".

8. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact Electronic Business Center (EBC) at 866-217-9197 (toll-free).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zia Hashmi whose telephone number is (571) 272-2473. The examiner can normally be reached between 8.30 AM- 5 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477.

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Zia Hashmi

January 26, 2006.



NIKITA WELLS
PRIMARY EXAMINER

02/03/06